

APPARATUS AND METHOD FOR USING A HINGE TO COMMUNICATE SIGNALS BETWEEN A FIRST CIRCUIT IN A FIRST HOUSING AND A SECOND CIRCUIT IN A SECOND HOUSING

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates in general to computers and, more particularly, to a method and apparatus for supplying power to the display in a portable computer.

2. Description of the Related Art

Since the proliferation of the personal computer as a personal and business tool, portable computers have been in high demand. Portable computer manufacturers are continually refining the portable computers to have a greater number of features while reducing the size and weight of the units.

Very low weight portable computers are referred to as "notebook" computers. At one time, notebook computers were stripped of many features in order to reduce weight and size; however, current day notebook computers are full-featured.

In notebook displays, the trend is clearly towards providing larger, higher resolution screens which are comparable to CRT (cathode ray tube) screens used with desktop computers. As the resolution and color depth supported by the display increases, the amount of information which must be sent from the main housing to the display housing similarly increases. In many cases, the additional bandwidth is accommodated by increasing the number of signal lines between the main housing and the display housing.

Simply increasing the number of signal lines has its drawbacks. First, with the addition of each line, the amount of EMI (electro-magnetic interference) increases. EMI is strictly regulated by the FCC (Federal Communication Commission). Second, the signal and power lines passing between the main housing and the display housing are typically threaded through one of both of the hinges (or other rotation mechanism) connecting the two housings by manual assembly. As the number of video signal lines increases, the additional volume makes threading the signals lines through a hinge more difficult.

Therefore, a need has arisen in the industry to provide an efficient, low interference method and apparatus for passing signals between two connected housings.

SUMMARY OF THE INVENTION

The present invention provides a efficient manner of routing signal lines between a first housing containing a first circuit and a second housing containing a second circuit. A hinge connected to said first and second housings includes one or more first hinge pieces coupled to said first circuit and one or more second hinge pieces coupled to respective ones of said first hinge pieces and to said second circuit, respective pairs of said first and second hinge pieces being operable to communicate a signal between one another.

The present invention provides significant advantages over the prior art. Because the hinge itself is able to carry the signals between the first and second housings, the cable between the first and second housings can be eliminated or, at least, reduced in size. By using a photoemitting device to transmit signals through the first hinge members and photosensitive receivers (such as a PIN diode) to receive the light signal through the first hinge members, EMI can be greatly reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates a prior art structure for communicating signals between a main housing and a display housing in a notebook computer;

FIG. 2 illustrates a preferred embodiment of a structure for communicating signals through a hinge coupling separate housings of a notebook computer;

FIG. 3 illustrates a cross-sectional view of a portion of a hinge using in FIG. 2 for conducting electrical signals;

FIG. 4 illustrates an exploded view of a hinge member shown in FIG. 3;

FIGS. 5a and 5b illustrates the hinge member of FIGS. 3 and 4 used in a notebook computer in open and closed configurations;

FIG. 6 illustrates an exploded view of a hinge member used to communicate optical signals;

FIGS. 7a and 7b illustrate the hinge member of FIG. 6 used in a notebook computer in open and closed configurations; and

FIG. 8 illustrates an alternative embodiment for transmitting information between separate housings using optical transmission of signals.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is best understood in relation to FIGS. 1-8 of the drawings, like numerals being used for like elements of the various drawings.

FIG. 1 illustrates a prior art structure for providing video signals and power in a notebook computer 10. The notebook computer 10 includes a main housing 12 and a display housing 14. The main housing 12 typically includes the processing electronics such as the central processing unit, video controller, sound circuitry, main memory, mass storage memory and input/output circuitry. The display housing typically includes a flat panel display, such as a LCD (liquid crystal display) panel or an FED (field effect display) and associated electronics.

A cable 16 is disposed through one or more hinges 18 which connect the main housing and the display housing. The cable includes signal lines 20 for all signals which must be passed between the two housings. Typically, these signals will include the video information signals and the power signals, including one or more voltage signals and a ground signal.

As previously discussed, as the number of signal lines between the two housings increases, the ability to use this structure while limiting EMI noise becomes more and more difficult.

FIG. 2 illustrates a notebook computer 30 using a hinge 32 which passes signals through hinge members 34. As in FIG. 1, the notebook computer 30 includes a main housing 36 and a display housing 38. The main housing 36 typically includes the processing electronics such as the central processing unit, video controller, sound circuitry, main memory, mass storage memory and input/output circuitry. The display housing 38 typically includes a flat panel display, such as a LCD (liquid crystal display) panel or an FED (field effect display) and associated electronics.

Signals to be passed between the main housing 36 and the display housing 38 are passed through hinge members 34,